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Abstract

1,236,495. Battery terminals. SEMPERIT A.G. 23 Oct., 1969 [25 Oct., 1968], No. 51957/69. Heading H1B. The lead terminal of a secondary cell com- prises a shell having one or more circumferential ribs on its outside, at least one rib being thinner at its base than at its apex. As shown in Fig. 4 the shell 1 carries two circumferential ribs 21, 4 having a reversed taper and forming a dovetail joint with the cell cover 7 which is injection moulded around the terminal. Shrinkage of the material, e.g. hard rubber, of the cover forces the material in the dovetail against the ribs forming a tight seal. In other embodiments the lower rib 2 is untapered and braced by fillets to the shell (Fig. 2, not shown), and the shell is curved outwardly between the ribs so that after the cover shrinks it springs back against it (Fig. 5, not shown). The terminals are made by casting with the taper of the ribs on the outside (Fig. 3) and bending the tapered ribs inwardly to the position shown in Fig. 4.

(1)

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DRAWINGS ATTACHED

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H1B D12 D8F D9X

(54) IMPROVEMENTS IN OR RELATING TO LEAD TERMINALS

(71) We, SEMPERIT AKTIENGESELLSCHAFT, formerly Semperit Osterreichisch-Amerikanische Gummiwerke Aktiengesellschaft, an Austrian Company of Wiedner Hauptstrasse 63, A 1041 Vienna 4, Austria,

do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to a lead terminal for storage battery cell covers of hard rubber, the outer side of the shell of the terminal having one or more ribs arranged thereon, and running in the circumferential direction.

In recent years, battery manufacturers have tested the gas-tightness between hard rubber and the pressed-in lead terminals. The cell covers carrying the lead terminals are produced either by the injection moulding process by extrusion at about 1200 atmospheres, or by pressing. Tests have now shown that in the cooling of the cell cover after formation, a shrinking away of the hard rubber from the lead terminal occurs. In this way, gaps result around the lead terminals through which gas can escape from the battery chamber.

Attempts have been made to lengthen the creep paths by the arrangement of parallel ribs on the shell surface of the lead terminal whereby however no satisfactory results have been achieved.

It has furthermore been proposed to provide the lead terminals with an adhesive to produce a tight connection with the hard rubber of the cell lid. In this process, it is however, necessary that the upper part of the lead terminal should subsequently be cleaned, since an insulating layer can easily be formed thereon due to the adhesive.

It is an object of the present invention to provide a lead terminal which can be inserted in gas-tight fashion in the cover, without having to be later processed.

According to the invention, there is provided a lead terminal for a storage battery cell cover comprising a shell having one or more ribs arranged on the outer side thereof and running in the circumferential direction, wherein the thickness of said rib or of at least one of said ribs increases from its base towards its apex over at least a part of the height of the rib. Preferably, the outer flank of the rib is perpendicular to the axis of the lead terminal. In this way, an essentially dove-tail shaped groove can be formed between two opposite ribs, which groove runs in the circumferential direction. The rib of the invention has an inclined surface against which the heard rubber is pressed during shrinkage. In this way, a sealed surface is formed, which prevents gas passing through. Moreover, cell covers incorporating such terminals do not need to be further processed, since on adhesive has to be used. The sealing effect is still further increased when at least wo such ribs are designed to be enantiomorphous in their cross-sectional shape.

Despite this design of the ribs, it cannot, however, be prevented that during shrinkage, the hard rubber lift itself away from the shell surface of the lead terminal between the ribs. This disadvantage can, however, be overcome by making the shell surface curve outwardly between the ribs. In this way, a spring effect is achieved in this part of the lead terminal the shell springs towards the hard rubber which has shrunk away.

Lead terminals with a rib design in accordance with the invention are technically very difficult to produce since they require a very complex mould. A process for the production of the lead terminal in accordance with the invention, is therefore, proposed in which a blank is produced in an injection mould, in which blank the flanks of the ribs facing one another are parallel to one another, and the flanks facing away from one another form an angle with one another, whereafter at least one rib is bent in the axial direction in relation to the other one, preferably until the flanks facing away from one another are parallel to one another. For this process, a relatively simple and cheap mould is sufficient.

Furthermore, the curving of the shell surface can be achieved by upsetting the blank in the axial direction. This upsetting process, can, for example, take place at the same time as the bending of the ribs.

The angle between the two flanks of a rib is important, on the one hand, for the sealing of the lead terminal and, on the other hand, for the bending of the ribs. It can be between 5 and 30°; an optimum is given with an angle of 20°. With this angle, on the one hand, a good sealing effect is achieved and, on the other hand, the ribs can be easily bent through this angle without tearing resulting. It has been found that a lead alloy containing 7% by weight of antimony is particularly suitable for the lead terminals in accordance with the invention. A tendency to tearing can also be reduced if the edges between the shell surface and the ribs are rounded. Furthermore, additional ribs with parallel flanks can, of course, be provided between the ribs on the shell surface. In this way, a sure fit is achieved.

The invention will now be further described with reference to the drawings, in which:—

Figure 1 is a side sectional view of one half of a blank for use in making a first form of terminal in accordance with the invention;

Figure 2 is a similar view of the terminal of Figure 1 in position in a cell cover;

Figure 3 is a similar view of a blank for use in making a second form of terminal according to the invention;

Figure 4 is a similar view of the terminal of Figure 3 in position in a cell cover;

Figure 5 is a similar view of a third form of terminal in accordance with the invention in position in a cell cover;

Figure 6 is a side sectional view on an enlarged scale of part of a terminal according to the invention to illustrate a modified shape of rib; and

Figure 7 is a side sectional view of part of a mould for making the blank of Figure 3.

The blank illustrated in Figure 1 consists of a tubular shell 1, whose lower section carriers a circumferential rib 2 having parallel flanks on the outside, which rib is strutted by means of transverse ribs 3. In the upper section of the shell 1, a further circumferential rib 4 is formed on the outside of the shell 1, the flank 5 of which rib facing towards the circumferential rib 2 runs perpendicular to the axis, whilst the outer flank 6 of the rib 4 is inclined by an angle α to the direction of the flank 5. The angle α is preferably 20°. This blank is placed into a press after casting, in which press the circumferential rib 4 is bent towards the circumferential rib 2 until the flank 6 is perpendicular to the axis, and the flank 5 is inwardly inclined by the angle α. Subsequently, the lead terminal is placed into a mould for a cell cover. Thereafter, as shown in Figure 2, the cell cover 7 is produced, for example, by injection moulding, so that the intermediate space between the ribs 4 and 2 is filled by the material of the cover, e.g. hard rubber. In the subsequent shrinkage of the cell cover 7, the hard rubber is now pressed in sealing fashion against the flank 5 of the circumferential rib 4. The inner flank 5 of the circumferential rib 4. The inner flank 8 of the circumferential rib 2 serves as a counter-surface.

The sealing effect can be increased by the use of a lead terminal in acordance with Figure 4. In this, the flank 8 is additionally inclined to the flank 5, preferably symmetrically. In the production of such a lead terminal, a blank in accordance with Figure 3 is required, in which the circumferential rib 2′ also possesses a flank 9 outwardly inclined.

Figure 5 shows a further embodiment of lead terminal according to the invention, in which the shell 1 is outwardly curved in the region between the circumferential ribs 2′ and 4, in order to guarantee a better springing against the cell cover 7. This curving can be effected by upsetting the shell, e.g. at the same time as the bending of the ribs. In Figure 6, the upper region of the circumferential rib 4 is shown in enlarged fashion. Between the inclined flank 6 and the upper outer section 10 of the shell 1, the edge is rounded by the radius r. By this means, possible tear formation in this region during the bending of the rib is avoided.

In Figure 7 the mould for producing a blank for a lead terminal in accordance with the invention is illustrated. It consists of a mould upper part 11 with a mandrel 12 for forming the bore of the lead terminal and with a ring-shaped projection 13 for forming the flank 6 of the circumeferential rib 4. The mould underpart 14 form the flank 9 of the circumferential rib 2′ and abuts against the mandrel 12 of the mould upper part 11. Moreover, the mould possesses two side mould halves 15 and 16, which mould the outer surfaces of the ribs 2′ and 4 and the shell 1, as well as the inner flanks 5 and 8 of the circumferential ribs 2′ and 4 respectively. This mould can be easily assembled and disassembled, since the mould upper part 11 can be moved upwards and the mould halves 15 and 16 can be moved perpendicularly to the axial direction of the lead terminal.

WHAT WE CLAIM IS:—

1. A lead terminal for a storage battery cell cover comprising a shell having one or more ribs arranged on the outer side thereof and running in the circumferential direction, wherein the thickness of said rib or of at least one of said ribs increases from its base towards its apex over at least a part of the height of the rib.

2. A lead terminal as claimed in Claim 1 wherein the outer flank of said rib is perpendicular to the axis of the lead terminal.

3. A lead terminal as claimed in Claim 1 or Claim 2, wherein one flank of at least one rib forms an angle of 5—30°, with other flanks of the rib.

4. A lead terminal as claimed in Claim 3 wherein said one flank forms an angle of 20° with said other flank.

5. A lead terminal as claimed in any one of the preceding claims wherein at least two ribs are designed to be enantiomorphous as regards their cross-sectional shape.

6. A lead terminal as claimed in any one of the preceding claims wherein the outer surface of said shell is curved outwardly.

7. A lead terminal as claimed in any one of the preceding claims wherein the edges between the shell surface and the rib or ribs are rounded.

8. A lead terminal as claimed in any one of the preceding claims wherein the outer surface of said shell is provided with additional ribs with parallel flanks.

9. A lead terminal as claimed in any one of the preceding claims, consisting of a lead alloy with a 7% by weight antimony content.

10. A lead terminal for a storage battery cell cover substantially as hereinbefore described with reference to Figure 1 and Figure 2 or Figure 3 and Figure 4, or Figure 5, or Figure 6 of the drawings.

11. A process for the manufacture of a lead terminal as claimed in Claim 1 comprising the steps of producing a blank in an injection mould, in which the flanks of two ribs facing one another are parallel to one another, and the flanks of said ribs facing away from one another form an angle with one another and thereafter bending at least one rib in the axial direction towards the other rib.

12. A process as claimed in Claim 11 wherein said rib or ribs is or are bent until the flanks facing away from one another are parallel and perpendicular to the axis of said terminal.

13. A process as claimed in Claim 11 or Claim 12 wherein the surface of said blank between said ribs is curved outwardly.

14. A process as claimed in Claim 13 wherein said surface is curved outwardly by upsetting said blank in the axial direction.

15. A process for the manufacture of a lead terminal substantially as hereinbefore described with reference to Figures 1 and 2, or Figures 3 and 4, of Figure 5, or Figure 7 of the drawings.

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1236495 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig. 1

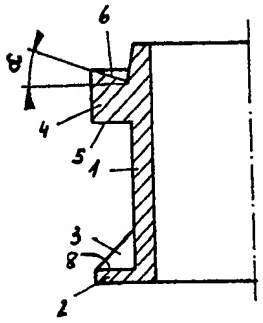


Fig. 2

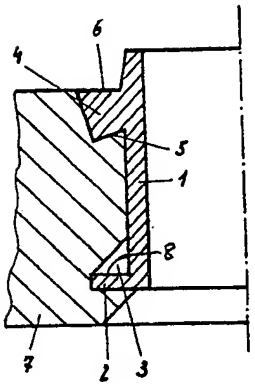


Fig. 3

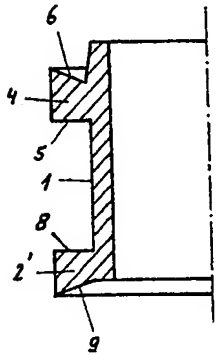
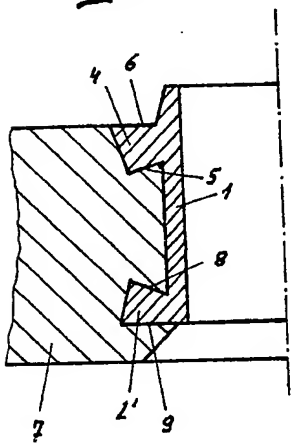


Fig. 4



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2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

Fig. 5

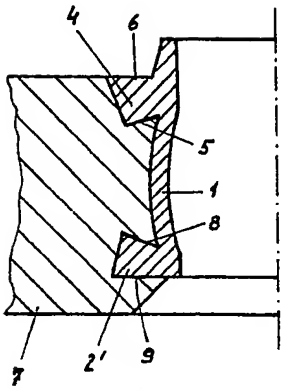

Fig. 6

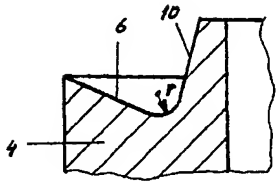

Fig. 7